

WHAT IS CLAIMED IS:

1. A gear changing device, comprising:
 - a drive motor rotatable in a forward direction or a reverse direction;
 - a sun gear that is rotated by the drive motor;
 - a planetary gear that is constantly engaged with the sun gear;
 - a rotating member that is concentric with the sun gear and rotates in a same direction as the sun gear when the sun gear rotates in the forward direction, so as to pivotally rotate the planetary gear around the sun gear, and that stops rotating when the sun gear rotates in the reverse direction, so as to allow the planetary gear to rotate on an axis of the planetary gear to a plurality of predetermined positions on a path of the planetary gear where the planetary gear pivotally rotates, the rotating member being provided on a circumference thereof with a plurality of recesses and projections that are one of indented and protruded in a diametrical direction of the rotating member, the rotating member alternately disposing the recesses and projections, each having a specific width;
 - a plurality of transmission gears that are engaged with the planetary gear at the predetermined positions on the path of the planetary gear where the planetary gear pivotally rotates; and
 - a sensor switch that detects the recesses and the projections at a fixed position.
2. The gear changing device according to claim 1, further comprising a controller that detects, based on a signal from the sensor switch, at least one of a time at which a projection detection condition where one of the projections is detected is changed to a recess detection condition when one of the recesses is detected, and a time at which the recess detection condition is changed to the projection detection while the sun gear is rotated in the forward direction by controlling the drive motor, the controller recognizing at the time, an operation mode in which the planetary gear and any of the transmission gears can be engaged with each other.
3. The gear changing device according to claim 2, wherein after recognizing the operation mode, the controller detects, based on the signal from the sensor switch, at least one of a time at which the projection detection condition is again brought about after the recess detection condition, and a time at which the recess detection condition is again brought about after the projection detection condition, and starts to rotate the sun gear in the reverse direction based on the detected time.
4. The gear changing device according to claim 3, wherein if the recess detection condition is not changed to the projection detection condition or the projection detection

condition is not changed to the recess detection condition after a predetermined time has passed since the sun gear starts to rotate in the reverse direction, the controller rotates the sun gear in the forward direction to rotate the rotating member once and thereafter starts to rotate the sun gear in the reverse direction to make a retry.

5. The gear changing device according to claim 1, wherein the gear changing device is for use in an apparatus that requires switching of a plurality of different operation modes according to engagement combinations of the planetary gear with the transmission gears.

6. A communication apparatus that performs communication with a remote communication apparatus, comprising:

a gear changing device, including:

a drive motor rotatable in a forward direction or a reverse direction;

a sun gear that is rotated by the drive motor;

a planetary gear that is constantly engaged with the sun gear;

a rotating member that is concentric with the sun gear and rotates in a same direction as the sun gear when the sun gear rotates in the forward direction, so as to pivotally rotate the planetary gear around the sun gear, and that stops rotating when the sun gear rotates in the reverse direction, so as to allow the planetary gear to rotate on an axis of the planetary gear to a plurality of predetermined positions on a path of the planetary gear where the planetary gear pivotally rotates, the rotating member being provided on a circumference thereof with a plurality of recesses and projections that are one of indented and protruded in a diametrical direction of the rotating member, the rotating member alternately disposing the recesses and projections, each having a specific width;

a plurality of transmission gears that are engaged with the planetary gear at the predetermined positions on the path of the planetary gear where the planetary gear pivotally rotates; and

a sensor switch that detects the recesses and the projections at a fixed position;

and

wherein the communication apparatus includes at least a transmission mode and a reception mode in association with the transmission gears.

7. The communication apparatus according to claim 6, further comprising a controller that detects, based on a signal from the sensor switch, at least one of a time of a projection detection condition where one of the projections detected is changed to a recess detection condition when one of the recesses is detected, and a time at which the recess

detection condition is changed to the projection detection while the sun gear is rotated in the forward direction by controlling the drive motor, the controller recognizing at the time, an operation mode in which the planetary gear and any of the transmission gears can be engaged with each other.

8. The communication apparatus according to claim 7, wherein after recognizing the operation mode, the controller detects, based on the signal from the sensor switch, at least one of a time at which the projection detection condition is again brought about after the recess detection condition and a time at which the recess detection condition is again brought about after the projection detection condition, and starts to rotate the sun gear in the reverse direction based on the time.

9. The communication apparatus according to claim 8, wherein if at least one of the recess detection condition is not changed to the projection detection condition and the projection detection condition is not changed to the recess detection condition after a predetermined time has passed since the sun gear starts to rotate in the reverse direction, the controller rotates the sun gear in the forward direction to rotate the rotating member once and thereafter starts to rotate the sun gear in the reverse direction to make a retry.

10. A communication apparatus that performs communication with a remote communication apparatus and includes modes of at least a transmission mode, a reception mode, and a copying mode, comprising:

a drive motor rotatable in a forward direction or a reverse direction;

a sun gear that is rotated by the drive motor;

a planetary gear that is constantly engaged with the sun gear;

a regulating unit that allows the planetary gear to pivotally rotate around the sun gear when the sun gear is rotated in one direction based on a rotation of the drive motor, and that prevents the planetary gear from pivotally rotating but allows the planetary gear to rotate on an axis of the planetary gear to a plurality of positions on a path of the planetary where the planetary gear pivotally rotates, when the sun gear is rotated in an opposite direction; and

a drive force transmission mechanism including a plurality of driven gears that engage with the planetary gear rotating on the axis thereof at the plurality of positions on the path of the planetary gear where the planetary gear pivotally rotates; and

wherein the communication apparatus selects a predetermined number of at least one position from the plurality of the positions on the path of the planetary gear with the

regulating unit in association with each of the modes, and selectively rotates the driven gears by rotating the planetary gear on the axis thereof at the at least one position that is selected.

11. The communication apparatus according to claim 10, further comprising a rotating member that is concentric with the sun gear and rotatable, the rotating member including a pair of arms forming a predetermined angle and rotatably supporting the planetary gear at each of the arms, and

wherein the regulating unit has a frictional load generating device that is disposed between the sun gear and the rotating member and that switches a frictional load generated therebetween according to rotating directions of the sun gear, and a rotation regulating member that regulates a rotation of the rotating member.

12. The communication apparatus according to claim 11, wherein the predetermined angle formed by the arms of the rotating member is set to such an angle that two positions on the path of the planetary gear where the planetary gear pivotally rotates are selectable.

13. The communication apparatus according to claim 12, wherein the planetary gear rotatably supported by each of the arms selectively engages with one of the driven gears in the copying mode.

14. The communication apparatus according to claim 10, wherein a sheet feeding operation for feeding a recording sheet, a recording operation for performing recording onto the recording sheet with a recording head, and a sheet discharging operation for discharging the recording sheet are performed in the reception mode and the copying mode, and a driven gear among the plurality of the driven gears that is required for the sheet feeding operation, the recording operation, and the sheet discharging operation is consecutively disposed on the path of the planetary gear.

15. The communication apparatus according to claim 14, wherein the recording head is a thermal head that performs recording onto the recording sheet through a ribbon, and wherein the communication apparatus further includes a gear for feeding the ribbon and when the driven gear required for the sheet feeding operation or the sheet discharging operation is selected from the plurality of the driven gears, the driven gear that is selected is disconnected to the gear for feeding the ribbon.

16. The communication apparatus according to claim 11, further comprising a base member that rotatably supports each of the driven gears and has a positioning opening formed thereon so as to correspond to each of the plurality of positions on the path of the planetary gear where the planetary gear pivotally rotates, and

wherein the regulating unit includes an elastic protrusion that is provided on the rotating member and engages in the positioning opening at each of the positions on the path of the planetary gear.

17. A communication apparatus that performs communication with a remote communication apparatus, the communication apparatus having modes of at least a transmission mode, a reception mode, and a copying mode, and including executable operations of a document feeding operation for feeding a document to be read, a sheet feeding operation for feeding a recording sheet, a recording operation for performing recording onto the recording sheet with a recording device, and a sheet discharging operation for discharging the recording sheet, the communication apparatus, comprising:

a drive force transmission mechanism, including:

a drive motor rotatable in a forward direction or a reverse direction;

a sun gear that is rotated by the drive motor;

a planetary gear that is constantly engaged with the sun gear;

a regulating unit that allows the planetary gear to pivotally rotate around the sun gear when the sun gear is rotated in one direction based on a rotation of the drive motor, and that prevents the planetary gear from pivotally rotating but allows the planetary gear to rotate on an axis of the planetary gear to a plurality of positions on a path of the planetary where the planetary gear pivotally rotates, when the sun gear is rotated in an opposite direction; and

a plurality of driven gears that engage with the planetary gear rotating on the axis thereof at the plurality of positions on the path of the planetary gear where the planetary gear pivotally rotates; and

wherein the communication apparatus associates the driven gears with any of the executable operations, at least one of the driven gears to be used in each of the modes is predetermined, at least one position on the path of the planetary gear that is associated with the at least one of the driven gears, is selected with the regulating unit according to the modes to be executed as the sun gear is rotated in one direction, and the at least one of the driven gears associated with the at least one position that is selected, is driven by rotating the planetary gear on the axis thereof as the sun gear is rotated in an opposite direction, to selectively execute the modes.